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**REVIEW OF THE IMPLEMENTATION OF COMMITMENTS
AND OF OTHER PROVISIONS OF THE CONVENTION**

**NATIONAL COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I
TO THE CONVENTION**

Second compilation and synthesis of second national communications

Summary

Note by the secretariat

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I. INTRODUCTION

A. Background

1. Articles 4.1, 4.2 and 12 of the Convention require Parties included in Annex I to the Convention to communicate information periodically to the Conference of the Parties (COP). By its decision 9/CP.2,¹ the COP requested Parties to submit second national communications by 15 April 1997, while Parties with economies in transition should, in principle, submit their communications no later than 15 April 1998. In preparing these communications, Parties were requested to use the guidelines contained in the annex to decision 9/CP.2.

2. As requested by the COP, and decision 9/CP.2, a first compilation and synthesis of second national communications from Annex I Parties was prepared for consideration by the COP at its third session. At that session, the COP, by its decision 6/CP.3,² requested the secretariat to prepare a full compilation and synthesis of second national communications from Annex I Parties for consideration at its fourth session. In response to this, the present document has been prepared drawing upon information from 36 Parties included in Annex I to the Convention.³

B. Approach

3. The summary of the compilation and synthesis in this document focuses on broad trends during the period 1990 to 2010. The full compilation and synthesis is provided in document FCCC/CP/1998/11/Add.1, and tables with data on greenhouse gas emissions inventories and projections have been compiled in document FCCC/CP/1998/11/Add.2. Key issues related to the revision of the guidelines for the preparation of national communications are included in a separate section in the full document, and could serve as inputs to the process for revising further the reporting guidelines.

II. REPORTING ISSUES

4. Nine Parties submitted their second national communications by the due date, and five Parties had not submitted their second national communications by 15 September 1998. The late receipt of national communications, and the fact that few Parties fully complied with the guidelines, in particular reporting data in tabular format, has hindered the process of compilation

¹ FCCC/CP/1996/15/Add.1.

² FCCC/CP/1997/7/Add.1.

³ The document includes information from all Parties included in Annex I, except Romania. Information from 30 second national communications, the draft second national communications of the Russian Federation, and excerpts of the second national communications of Italy and Luxembourg are considered. The first national communications of Lithuania and the Ukraine, and an excerpt of the first national communication of Slovenia, are also considered as they were not considered in earlier compilation and synthesis reports of first national communications.

and synthesis as well as the timely consideration of the information required to be submitted by Parties (see table below).

Submission of second national communications

Delay in submission	Annex I Parties	
	Annex II (15 April 1997)	Economies in transition (15 April 1998)
on time	Finland, Germany, Netherlands, Norway, United Kingdom	Czech Republic, Estonia, Hungary, Slovak Republic
1 month	Canada, Monaco, ⁴ Sweden, Switzerland	Poland
1-3 months	France, Ireland, New Zealand	Bulgaria, Latvia
3-6 months	Austria, Belgium, Iceland, United States	
6-12 months	Australia, Denmark, Greece, Japan, Portugal, Spain	
>12 months	European Union	
not submitted ⁵	Italy, Luxembourg	Lithuania, Romania, Russian Federation

5. In accordance with Article 4.6 of the Convention, Parties with economies in transition (EITs) may seek a certain degree of flexibility with respect to the implementation of their commitments. The Czech Republic, Poland and Ukraine noted their difficulty in presenting information related to projections of emissions of greenhouse gases. In preparing its second national communication Poland used the UNFCCC Guidelines developed for the first national communications. Poland also invoked flexibility with regard to presentation of inventory data on a two-year, instead of an annual, basis.

III. TRENDS IN GREENHOUSE GAS EMISSIONS

A. Reported levels: 1990-1995

6. In 1990, Annex I Parties collectively emitted in CO₂ equivalent approximately 17,500,000 Gg of the six greenhouse gases (CO₂, CH₄, N₂O, HFC's, PFC's and SF₆), not including the land-use change and forestry (LUCF) sector. In 1995, these emissions were about 4.6 per cent lower. These aggregate emissions dropped sharply between 1990 and 1991, decreased less sharply over the next three years, and have increased since 1994. Contributing to this overall trend, EITs have exhibited declining emissions from 1990 levels, with a reversal of this trend

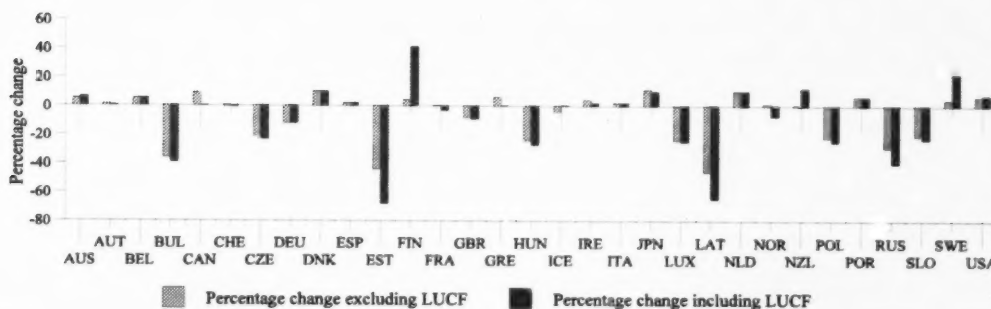
⁴ Monaco notified the Depositary of its intention to be bound by subparagraphs (a) and (b) of Article 4.2 of the Convention on 24 November 1992.

⁵ Ukraine has not submitted its second national communication since its first national communication was submitted in February 1998 as due.

starting to occur for these Parties after 1994.⁶ Emissions from EITs declined by 28 per cent and emissions from the European Community, as reported in its national communication, declined by 3.8 per cent during the period. Annex II Parties as a whole exhibited growing aggregated GHG emissions, with an increase of 3.5 per cent from 1990 to 1995. Only Germany, Luxembourg and the United Kingdom reported decreasing emissions throughout the period.⁷

7. The decline in "net" aggregate GHG emissions (including land-use change and forestry) between 1990 and 1995 is greater than the decline in gross emissions (excluding land-use change and forestry), reflecting increasing reported sequestration in Annex I Parties as a whole; these "net" emissions were 6.7 per cent lower in 1995 than in 1990 (see figure 1).

Figure 1. Percentage change in aggregate GHG emissions, 1990 to 1995 (excluding and including land-use change and forestry)



Note: Canada, Greece, Iceland and Monaco did not report estimates from the land-use change and forestry category. Austria reported total GHG emissions including land-use change and forestry in 1995 at the same level as in 1990, and France, New Zealand and Switzerland in 1995 reported emissions at the same level as in 1990, excluding the land-use change and forestry category.

8. In 1995, for Annex I Parties as a whole on a CO₂ equivalent basis, carbon dioxide contributed the largest share to total aggregated GHG gross emissions (82 per cent), followed by CH₄ (12 per cent) and N₂O (4 per cent), while HFCs, PFCs and SF₆ taken together contributed to about 2 per cent of total emissions. The relative shares of the gases did not change significantly from 1990 to 1995, with the exception of an increase for HFCs, PFCs and SF₆ from 1.5 to 2.1 per cent over the period, reflecting sharply rising use and emissions of these substances.

9. Total CO₂ emissions in 1990 for Annex I Parties as a whole were approximately 14,300,000 Gg. These emissions decreased by 5 per cent from 1990 to 1995. For Annex II Parties considered as a group emissions of CO₂ increased by 3 per cent while for EITs they decreased by 29 per cent.

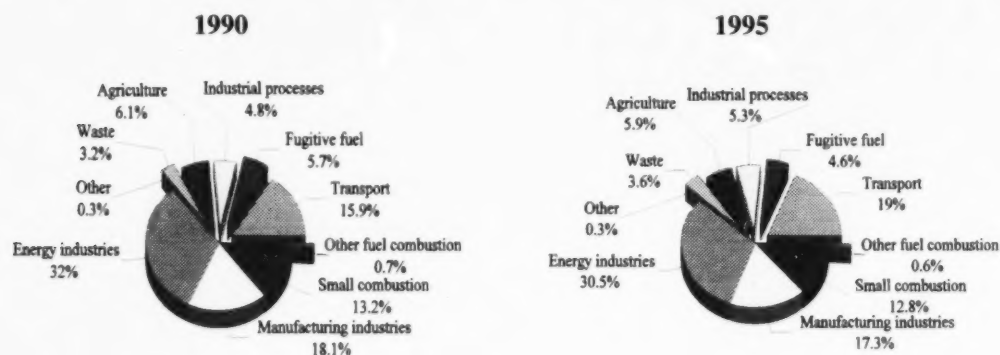
⁶ EITs accounted for 24 per cent of greenhouse gas emissions from Annex I Parties as a whole in 1995.

⁷ This was due to a shift from coal to gas in Germany (and to the effects of reunification) and in the United Kingdom and the conversion of blast furnaces to electric arc furnaces in Luxembourg.

10. The fuel combustion category typically accounts for some 95 per cent of a Party's CO₂ emissions. Within this category, the energy and transformation industries sub-category is the largest source of CO₂ emissions and accounts for approximately 36 per cent of total CO₂ emissions. Emissions from this sub-category were 2 per cent lower in 1995 than in 1990 for Annex I Parties as a whole, while emissions from Annex II Parties as a group remained stable.

11. In the transport sub-category, however, CO₂ emissions have grown rapidly, with transport emissions rising from 15.9 to 19 per cent of Annex I Party emissions between 1990 and 1995. This represents the most significant rise of any sector (see figure 2). All Annex II Parties (except Finland and Switzerland) exhibit increased emissions from transport in 1995 between 2 per cent and 31 per cent higher than in 1990, and on average 12 per cent higher. There is an accelerating increase in transport emissions, both in EITs and in Annex II Parties. Although the growth in emissions from passenger vehicles accounts for the bulk of the increase, emissions from aviation, which are smaller in absolute terms, are increasing at a faster rate.

Figure 2. Share of GHG emissions by source, 1990 and 1995



12. Total CH₄ emissions from Annex I Parties were about 108,000 Gg in 1990 and decreased by 8 per cent from 1990 to 1995. The overall decrease can be explained mainly by decreases in emissions from fugitive fuel and, to a lesser extent, from the agricultural sector. Emissions from waste have grown in most Parties, but not by enough to offset this decreasing trend.

13. Total N₂O emissions for all Annex I Parties were about 2,200 Gg in 1990 and decreased 6 per cent from 1990 to 1995. Several contrary trends underlie this aggregate figure. Emissions growth in the transport sectors was offset by a significant decline in emissions from industrial processes, largely due to declining emissions from adipic acid production. Mixed patterns are observed in N₂O emissions from agriculture.

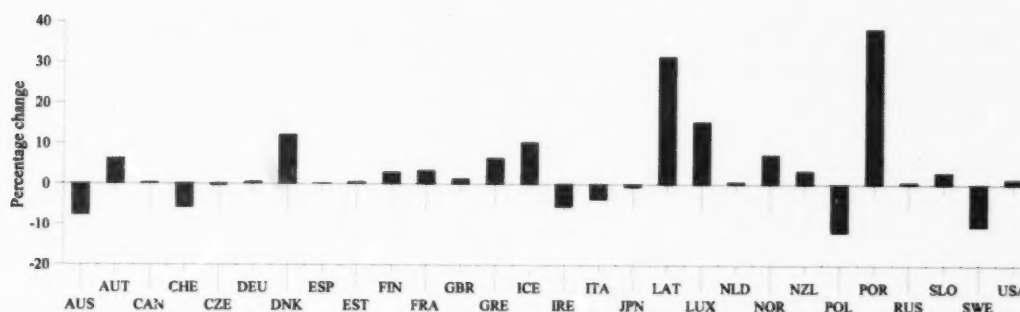
14. For those Annex I Parties which reported information from the land-use change and forestry category, combined CO₂ sequestration amounted to about 1,250,000 Gg in 1990 and

1,400,000 in 1995.⁸ This reflects the increasing importance being given to enhancing sinks. The average annual sequestration is about 10 per cent of the annual CO₂ emissions from Annex I Parties as a whole.

15. Annex I Party CO₂ emissions from international bunkers were approximately 3 per cent of total CO₂ emissions in 1990 and 8 per cent of emissions from the transport sector. These emissions increased by about 10 per cent from 1990 to 1995, one of the largest rates of increase for any category. For Greece, Iceland and the Netherlands they constitute more than 15 per cent of total CO₂ emissions.

16. The 1990 inventory data has been revised by all Parties, except two,⁹ as a result of additional information or changes in the methodology used. Revised data were both higher and lower than the data originally submitted, and for some Parties the change is quite significant (see figure 3). The revised 1990 figures for Annex I Parties as a whole are about the same as previous estimates in absolute terms.

Figure 3. Changes in 1990 (or base year) GHG inventories between first and second national communications



Note: For purposes of consistency and comparability, emissions of HFCs, PFCs and SF₆, and emissions/removals from land-use change and forestry are not considered in this figure.

B. Projected levels: 2000 and 2010

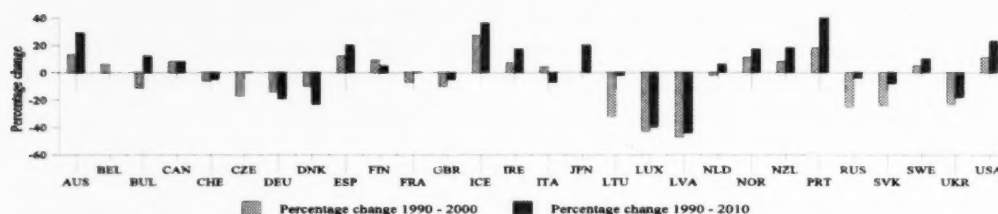
17. Aggregate emissions of greenhouse gases (excluding land-use change and forestry) from Annex I Parties as a whole are projected to be approximately 3 per cent below 1990 levels in the

⁸ EITs share of the sequestration was about 40 per cent in 1990 and 50 per cent in 1995.

⁹ Bulgaria did not revise its base year (1988) inventory, but did revise its 1990 inventory, and Hungary did not provide either a base year (1985-87) or 1990 inventory in its second national communication.

year 2000 and about 8 per cent above 1990 levels in the year 2010¹⁰ (see figure 4).

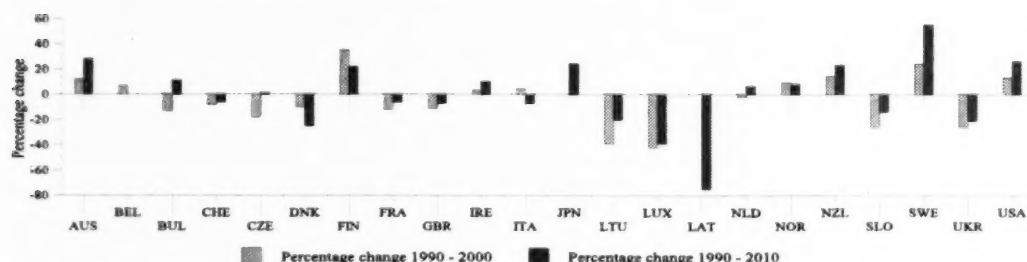
Figure 4. Percentage change in aggregate GHG emissions, 1990 to 2000 and 2010 (excluding land-use change and forestry)



Note: Austria, Estonia, Greece, Hungary, Monaco, Poland and Slovenia did not report projections for all three main GHGs (CO₂, CH₄ and N₂O), and therefore they were not included here. Belgium reported projections for all GHGs until 2005, and Japan for 2010 only. The Czech Republic and France projected total GHG emissions in 2010 to be at 1990 levels.

18. Aggregate greenhouse gas emissions from Annex I Parties, with the inclusion of land-use change and forestry,¹¹ are projected to be approximately 5 per cent lower in the year 2000 as compared to 1990, and about 7 per cent higher in the year 2010¹² (see figure 5).

Figure 5. Percentage change in aggregate GHG emissions, 1990 to 2000 and 2010 (including land-use change and forestry)



Note: Austria, Canada, Germany, Greece, Hungary, Iceland, Monaco, Poland, Portugal, Russian Federation, Slovenia and Spain did not report projections in the land-use change and forestry category, and Latvia reported land-use change and forestry projections for 2010 only. Belgium reported projections for all GHGs only until 2005, and Japan for 2010 only. Although Estonia reported land-use change and forestry projections, as it did not report projections for CH₄ and N₂O, and is not included here.

¹⁰ It is estimated that emissions from Annex II Parties will be about 5 per cent and 13 per cent above 1990 levels in 2000 and 2010 respectively; and emissions from EITs will be about 24 per cent and 7 per cent below 1990 levels in 2000 and 2010, respectively.

¹¹ The estimates given in this document with respect to land-use change and forestry are approximate and have been derived on the basis of projections or the latest inventory data reported.

¹² It is estimated that emissions from Annex II Parties will be about 6 per cent and 14 per cent above 1990 levels in 2000 and 2010 respectively; and emissions from EITs will be about 31 per cent and 11 per cent below 1990 levels in 2000 and 2010 respectively.

19. Estimates reported in the second national communications differed from the values presented in the first national communications for almost all Annex I Parties. The differences arise principally from changes in assumptions regarding key variables in models and, to a lesser extent, from different rates of implementation of policies and measure to those expected, or as a result of changes in the choice of methodology.

20. Projected carbon dioxide emissions in the year 2000 have been revised downwards for most Parties; of the five Parties that emit the most CO₂,¹³ only the United States has revised its projection upwards. All EITs and seven of the 24 Annex II Parties¹⁴ now expect their gross CO₂ emissions to be at or below their 1990 levels in the year 2000. The European Community's CO₂ emissions are projected to be in a range of up to 5 per cent of 1990 levels.¹⁵ Emissions of CO₂ from Annex I Parties as a whole are projected to be about 1 per cent below 1990 levels in the year 2000.

21. If emissions and removals from land-use change and forestry are included, six Annex II Parties¹⁶ expect net CO₂ emissions in the year 2000 to be at or below their 1990 levels. Many of the Parties which have reported large removals by sinks in 1990 have also predicted that these will increase. Emissions of CO₂ from Annex I Parties as a whole, including emissions and removals from land-use change and forestry, are projected to be 3 per cent lower in 2000 than their 1990 levels.

22. In the medium and longer term, almost all Annex I Parties predict gross CO₂ emissions to increase beyond 2000. EITs expect rapid growth of between one fourth and one third in the period 2000 and 2010. As a result, most EITs expect to be close to, or to have exceeded, their 1990 levels in 2010. Only six Annex II Parties¹⁷ expect a longer term downward trend. CO₂ emissions from Annex I Parties as a whole in 2010 are projected to be about 10 per cent higher than their 1990 levels. If emissions from land-use change and forestry are included, emissions of CO₂ are projected to be 8 per cent higher than 1990 levels in 2010.

23. Most Parties project lower methane emissions in 2000 than in 1990, including the three

¹³ The combined 1995 CO₂ emissions for Germany, Japan, the Russian Federation, the United Kingdom and the United States of America constitute 71 per cent of Annex I Parties' emissions.

¹⁴ The combined 1995 CO₂ emissions for Denmark, France, Germany, Luxembourg, the Netherlands, Switzerland and the United Kingdom constitute less than 16 per cent of Annex I Parties' emissions.

¹⁵ The second national communication of the European Community notes that while the compilation of member States' trajectories shows a stabilization of CO₂ emissions by the year 2000, alternative trajectories show a likely increase of emissions by 3-5 per cent.

¹⁶ The CO₂ emissions for 1995 for Denmark, France, Luxembourg, the Netherlands, Switzerland and the United Kingdom constitute 9 per cent of Annex I Parties' emissions. Emissions from Denmark and the Netherlands were higher in 1995 than in 1990.

¹⁷ The CO₂ emissions for 1995 for Austria, Denmark, Germany, Italy, Luxembourg and Switzerland constitute about 11 per cent of Annex I Parties' emissions.

Parties that emit the largest amount of this gas.¹⁸ Projections of CH₄ emissions for Annex I Parties as a whole are expected to be 14 per cent lower in the year 2000 than their 1990 levels, as a result of reduced emissions from agriculture.

24. Trends in CH₄ emissions till the year 2010 are mixed. However, the two Parties that emit the largest amount of this gas, the Russian Federation and the United States, expect their emissions to increase over this period. Projections for CH₄ emissions in 2010 for Annex I Parties as a whole are projected to be about 13 per cent lower than their 1990 levels.

25. Half of the Annex I Parties, including the five Parties that emit the largest amount of N₂O,¹⁹ have projected their emissions in 2000 to be at or below their 1990 levels. Projections of N₂O emissions in 2000 for Annex I Parties as a whole are projected to be about 17 per cent lower than their 1990 levels.

26. Trends in N₂O emissions indicate a gradual growth after 2000 until the year 2010 in practically all Annex I Parties, including those with a large share in Annex I Party totals for this gas.²⁰ Projections of N₂O emissions in 2010 for Annex I Parties as a whole are projected to be about 11 per cent lower than their 1990 levels, as a result of changes in manufacturing processes.

27. Less than half of the reporting Parties provided projections for HFCs, PFCs and SF₆. Those that provided projections for HFCs for the year 2000 expect considerable growth. A mixed trend is observed in the projections for PFCs for 2000 and, of those who provided the information, the general trend for SF₆ is of increasing emissions. In most cases, in the longer term, emissions of all these gases are projected to increase and their importance relative to other gases is expected to grow.

IV. POLICIES AND MEASURES

28. Annex I Parties reported little change in policies and measures between the first and second national communications. Most measures are primarily motivated by objectives other than climate change mitigation, such as the improvement of economic efficiency, restructuring of energy sectors and the promotion of energy efficiency, the improvement of air quality, and the reduction of traffic congestion. The spectrum of policies and measures is diverse, and includes economic instruments - particularly taxes, regulations, research and development of renewable energy and information programmes. While some measures will have long term impacts, little information was provided on modification of longer term trends in anthropogenic emissions.

¹⁸ The Russian Federation, Ukraine and the United States of America accounted for 60 per cent of Annex I Parties' CH₄ emissions in 1995.

¹⁹ France, Germany, Italy, the Russian Federation and the United States of America contributed 55 per cent of Annex I Parties' N₂O emissions for 1995.

²⁰ EITs emissions of N₂O are 14 per cent of total emissions from Annex I Parties as a whole.

29. Parties have reported the strengthening of some measures. They have emphasized energy efficiency improvements in both energy supply and energy end-use as an objective for achieving GHG mitigation, for example by market restructuring, increased financing of existing energy efficiency programmes and the adoption tighter building codes. Parties also reported continued efforts to promote further combined heat and power and to increase the share of fuels with low carbon and non-carbon content, including renewable sources. Other examples include increases in fuel and energy taxes and improved regulation of waste management including, *inter alia*, reductions in waste volumes and gas flaring. National targets for renewable energy development, both renewable technologies and biomass, is a policy measure which has received impetus from the need to mitigate climate change. The policy aims identified as particularly important are summarized in the box below.

**Policy aims identified as important or emphasized by
Parties in their second national communications**

- ▶ Increased efficiency in energy production and conversion, including co-generation
- ▶ Fuel switching from coal and heavy fuel oil to natural gas
- ▶ Research, development and shift to renewable energy
- ▶ Preservation and increase of carbon sinks in forests
- ▶ Increased energy end-use efficiency, improved thermal performance of new buildings and technical improvement in lighting, appliances and equipment
- ▶ Reduced livestock and fertilizer use
- ▶ Waste recycling, incineration, and methane recovery
- ▶ Improved efficiency of nitric and adipic acid, and aluminium production
- ▶ Improved average vehicle fuel economy

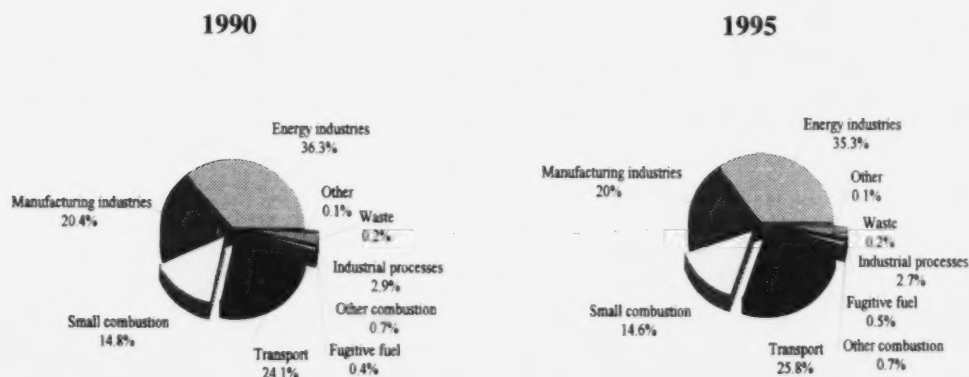
30. Energy market reform is occurring in many Annex I Parties, with variable degrees of privatization of utilities, competition in electricity production, generation and transmission - including the extent of separation of these activities into different companies, as well as privatization of gas and coal production and distribution. These changes are expected to have a large impact on carbon dioxide emissions in the year 2000 and beyond. Privatization and market liberalization can be accompanied by the removal of subsidies for fossil fuel production, raising the price of these fuels, and thus creating incentives for fuel switching. Further, companies' incentives to lower costs can lead to improvements in the efficiency of primary energy production, electricity generation and the transmission and distribution of energy. In addition, in some countries, along with market liberalization, a guaranteed market for electricity generation from renewable sources and/or combined heat and power (CHP) is being achieved through regulations, subsidies and taxation. There is evidence in second communications, including from EITs, that these reforms are indeed reducing greenhouse gas emissions. The general effect

of competition is to lower consumer prices and hence increase energy demand, although this may be offset by higher energy taxation. The overall effects of market reform in particular countries cannot be accurately predicted.

31. The promotion of energy efficiency measures is a major component of all carbon dioxide mitigation strategies. A variety of policies were used, including economic instruments in the form of energy taxation, or subsidies for energy efficiency audits and investments. Some Parties, particularly those with cold climates, have improved standards for new building insulation and energy rating for homes is becoming more commonplace. Some Parties are implementing measures to improve the insulation of existing buildings. As large firms are typically conscious of energy costs, most Parties target small firms and households with educational measures to encourage energy saving. Labelling of some domestic appliances, such as refrigerators and washing machines, with energy rating has become widespread, but thus far there is little evidence of this having made a significant impact on consumer choice. While energy conservation lowers the real price of energy it also induces expansion in energy demand, and the overall effects are difficult to predict.

32. Although all countries tax fuels and energy to varying degrees, mainly for revenue purposes, five Parties²¹ have adopted combined carbon/energy taxes, which are likely to have a greater effect in mitigating carbon dioxide emissions. However, rebates or exemptions for industry are often accorded on grounds of competitiveness. Some Parties expect to obtain significant reductions in the future through the use of these instruments.²² New Zealand is considering the introduction of a domestic emissions trading regime (see figure 6).

Figure 6. Distribution of CO₂ emissions by source categories, 1990 and 1995



²¹ Denmark, Finland, the Netherlands, Norway and Sweden.

²² For example, Sweden.

33. Parties are, in general, concerned about harming the international competitiveness of their domestic industry which constrains both the type and implementation of measures adopted. For this reason, voluntary agreements feature in many of the second national communications. In some cases, the agreements appear to be truly voluntary with most industries agreeing to targets to reduce energy use per unit of output. In other countries, there are mandatory elements, such as the possibility of applying alternative measures if the voluntary measures fail. Occasionally, voluntary agreements extend to the adoption of emission reduction targets by local authorities. Parties have also set goals for reducing emissions in the public sector, often through investments in energy efficiency measures in buildings. These measures succeed in accelerating the development and deployment of less energy intensive technology, although it is difficult to assess these effects against what might have happened otherwise.

34. Owing to concerns regarding firms' competitiveness and householders' budgetary constraints, most measures appear to influence the purchase of new equipment and not to increase greatly the rate of capital stock turnover. Similarly, the standard of energy efficiency in new buildings is improving more than that in existing stock. For these reasons, there may be a considerable time lag between the implementation of measures and the effect in terms of lowering emissions. Furthermore, as many Parties' industry and commercial sectors are growing and/or the housing stock is increasing, despite improvements in efficiency, emissions from these sources continue to grow.

35. Many Parties support research and development of renewable technologies as well as providing additional support for their market penetration. Parties differ considerably in the technical potential for different types of renewable energy; biomass accounted for approximately half of non-hydro renewable energy supply.²³ Those with significant hydroelectric power often have already almost fully exploited this source. In many countries, wind power appears to have the greatest technical potential and electricity generation from this source is becoming increasingly competitive vis-à-vis conventional power generation.²⁴

36. Parties have reported little success in overcoming the problem of capping rising emissions from transportation (see figure 7). Aims to improve the overall efficiency of public transport systems and increase the fuel efficiency of vehicles are being pursued, principally through taxation of fuel and vehicle purchase and circulation, regulations and/or voluntary approaches, as well as education and government sponsored R&D. However, the indications are that emissions will generally continue to rise, including for EITs. EITs aim to maintain the share of public transport by providing subsidies and tax breaks for public transport in urban areas.²⁵

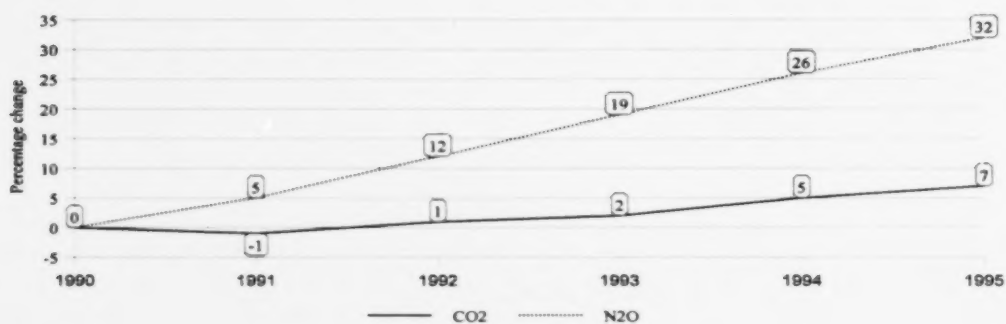
²³ Renewables accounted for about 6 per cent of the total energy supply of Annex II Parties in 1995. Solar and wind power are projected to account for 2 per cent of total energy supply of Annex II Parties in 2010.

²⁴ For example, Canada, Denmark, Germany, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, and the United States of America.

²⁵ For example, the Czech Republic, Hungary, Latvia and Slovak Republic.

However, integrated packages of measures which address the complex interactions among the underlying determinants of passenger and freight transportation energy use have not been identified by Parties.

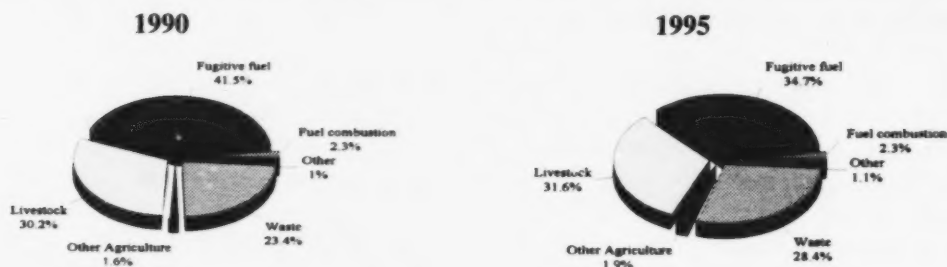
Figure 7. Trends in Annex I Parties' emissions from transport, 1990 to 1995



37. Enhancing sink capacities has emerged as an important supplement to the adoption of mitigation measures. Measures resulting in increased sequestration were undertaken generally in the context of national forestry policies and strategies. These measures include forest management practices, afforestation and reforestation. In Parties with a strong tradition in silviculture, management practices may increase sequestration even with intensive logging. Other Parties reported measures to increase sinks through afforestation and reforestation. Parties have also reported that the return of arable land to forestry and grassland within the context of reform of the of the European Union's Common Agricultural Policy (CAP), and the conversion of peatland and wetlands could also decrease emissions and/or increase removals.

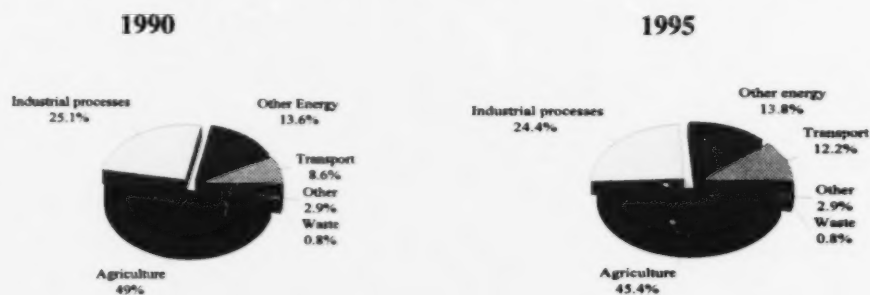
38. Reforms to the European Union's CAP and subsidy removal are expected to reduce methane emissions from agriculture by reducing livestock numbers. The removal or reduction of coal subsidies may lead to lower production, which could result in lower emissions. The replacement of old gas distribution networks with new ones will reduce leakages. But the largest methane emission reductions are expected to result from improvements to waste management activities, involving, *inter alia*, a reduction in the volume of waste disposed in landfills through recycling schemes, taxes, landfill fees and waste incineration, and the collection of gas from landfills and sewage treatment facilities for flaring or to generate electricity generation (see figure 8).

Figure 8. Distribution of CH₄ emissions by source categories, 1990 and 1995



39. Measures being implemented to reduce N₂O emissions have two principal aims: the improved efficiency of nitrogen fertilizer use and the modification of manufacturing processes for, or volumes of production of, nitric and adipic acid. Generally, these measures include voluntary agreements with industry; regulations requiring the use of best available technology which do not entail excessive costs; development of sustainable agriculture practices, such as the promotion of organic farming; subsidy reform; and implementation of European Union Directives in the agricultural sector (see figure 9).

Figure 9. Distribution of N₂O emissions by source categories, 1990 and 1995



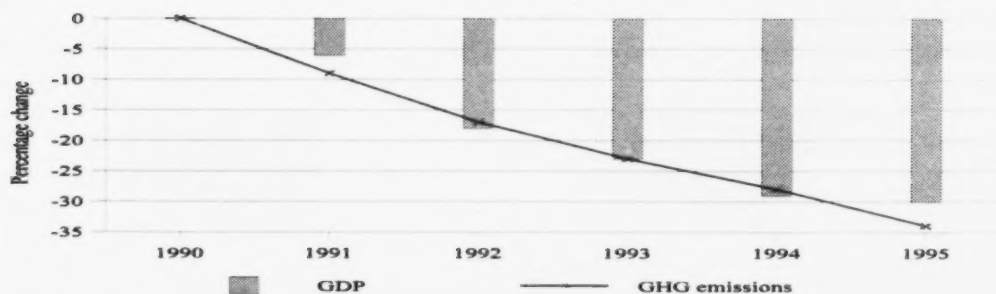
40. Emissions of HFCs, PFCs and SF₆ are currently low, but projected to grow. Few Parties have strategies, but some implement measures, such as voluntary agreements with industry, research on replacement or recovery of HFCs, and on appropriate alternative substances or technologies, and air quality laws.

41. For most European Parties, precursor gas emissions are regulated by European Union Directives, and emission levels of NMVOC and NO_x emissions are subject to Protocols to the UN-ECE Convention on Long-Range Transboundary Air Pollution. These include taxes for NO_x, CO, NMVOCs and SO₂, or emissions-oriented vehicle taxes, control of emissions produced by storage and distribution of oil products. There are also national regulations and voluntary agreements to reduce emissions produced in the petrochemical and power generation

sector, and in the paper pulp, cement and steel industries, and measures to control NMVOC emissions originating from the application of solvents include regulations and limits in the use and promotion of water-based paints.

42. All EITs emphasized that the process of transition to a market economy was characterized by drastic decreases in industrial output and domestic consumption, with corresponding decreases in gross domestic product and greenhouse gas emissions. Economic recovery began in EITs between 1993 to 1995, but these economies are not expected to start growing until the end of the decade. EITs report financial constraints which limit the abilities of these Parties to introduce measures to address climate change, particularly in light of other priorities. Possible synergy does exist between climate change objectives and some of these other broad policy objectives, for example, privatization, price liberalization and the establishment of capital markets. Reform during the transition has also provided the opportunity to implement new legislation, and introduce new regulations and economic instruments that have a direct or indirect impact on greenhouse gas emissions. Many EITs are seeking membership to the European Union, which has resulted in the development of strategies for convergence to European Union regulations covering, *inter alia*, a range of environmental measures; those affecting climate change are occurring mainly in the energy and transport sectors (see figure 10).

Figure 10. Trends in GDP and GHG emissions in Parties with economies in transition, from 1990 to 1995



Note: Includes data from Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Poland, the Russian Federation and Slovakia. GDP data is from "World Development Indicators 1997", World Bank.

43. The expected completion of new nuclear power projects will affect future emission trends in a few EIT Parties,²⁶ as will decisions on whether to decommission the plants that are nearing the end of their lifetimes or instead extend their lifetimes with technical adjustments. The identification of packages of measures in EITs to promote public transport, and encourage turn-over of vehicle fleets is not thought to be sufficient to curb expected high future rates of

²⁶ For example, Bulgaria, the Czech Republic, the Russian Federation, the Slovak Republic, and Ukraine.

growth in emissions from the transport sector. The policy of energy price liberalization and subsidy removal in EITs has gradually resulted in higher energy prices, creating incentives for energy saving and fuel switching to less costly options, such as natural gas. Substantial removal of subsidies, however, is not expected to occur before the year 2000. Large potential gains are believed to exist through energy efficiency improvements, and such projects have been identified by these Parties. The communications did not, however, provide an indication of the extent to which such reductions in emissions have already been achieved although that could be significant.

V. PROVISION OF FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

44. More information on the transfer of financial resources and technology was reported in the second national communications than in the first submissions, although the degree of detail of the information and the format of reporting still varied widely. Some Parties provided relatively detailed information on activities related to the provision of financial resources and transfer of technology, though they did not follow the tabular format requested by the Guidelines. As a result, it is difficult to identify trends in the flow of financial resources and the transfer of technology.

45. The information provided centred on financial contributions to multilateral institutions and for bilateral and regional cooperation. Although required by the Guidelines, little information was provided on private sector activities and projects related to transfer of technology, distinctions between hard and soft technology were not made, and only a few Parties explained how they had determined which resources were new and additional.

46. Based on the limited data provided, most financial resources appear to be obtained through multilateral institutions, and mainly through the interim operating entity of the financial mechanism. The regions receiving the largest share of bilateral financial resources are Asia and the Pacific and Africa. The energy and forestry sectors are the two main areas in which bilateral assistance is provided, both to developing countries and to economies in transition. In the energy sector, bilateral assistance is targeted principally at the improvement of energy efficiency, planning and management, market reform, and the use of renewable energy sources. Assistance is also being provided for the preparation of initial national communications from Parties not included in Annex I.

47. Bilateral projects and programmes are reported that will help countries to adapt to climate change, through the improvement of coastal zone management, the preservation of ecosystems on the edge of deserts, improvement of water management in dry areas, and development of meteorological stations and famine early warning systems.

48. Only a few Parties provided information separately on transfer of technology. The limited information provided suggests that the energy sector has received greatest emphasis,

followed by the forestry and agriculture sectors. The mechanisms adopted include exchange of information, and financial and technical assistance.

VI. OTHER COMMITMENTS

49. Efforts to promote and cooperate in research and systematic observation related to climate change, both at the national and international levels, are well-documented in second national communications. Since the first national communications, several Parties have begun to include in their programmes research into the socio-economic impacts of climate change. Little evidence was provided, however, of cooperation to improve the endogenous capacities and capabilities of developing countries to participate in international programmes and networks, or to strengthen their national scientific and technical research capabilities

50. Activities related to the expected impacts of climate change and vulnerability assessment are largely restricted to research, generally using scenario analysis to assess possible impacts and vulnerabilities. While some Parties reported positive impacts in agriculture (for example, Denmark), overall the impact of climate change is expected to be mixed, and largely negative in coastal and mountain areas. With a few exceptions - including the development of coastal defence mechanisms and programmes on water management and erosion control - Parties have not reported on the implementation of adaptation measures. Research on possible adaptation programmes, however, is expanding and Parties are considering new areas for action including urban management, additional programmes in coastal zone management and in mountain regions, and the preservation of endangered genetic material.

51. Parties have stressed the role played by education, training and public awareness in their response strategies. Schemes range from public awareness campaigns on energy saving aimed at the general public to more specific programmes which target a select group. A wide variety of media is used. Elements on climate change have been included in curricula, at the primary school, secondary school and university levels. Training programmes, for example those designed to encourage practice that results in limiting greenhouse gas emissions among specialized audiences, such as engineers and architects, have been reported less frequently. There is little mention of efforts to cooperate, at the international level, on the development and exchange of educational and public awareness materials, or on the implementation of programmes.

